GridTools

GridTools is a series of tools that operates on .dfs0 .dfs2 and dfs3-files. The tools are configured by an .xml-file. There is basically a zero-tolerance policy on errors. This means that any small spelling mistake will make the program crash. The tools can be combined and run in a series.

Layers count from 0, which is lowest layer.

Time steps counts from 0.

Items count from 1!

It is possible to select layers, time steps and items directly using their numbers or just write nothing in which case everything is selected. GridTools understands the following syntax for layers, time steps and items:

“0, 1, 5” = layers 0, 1 and 5.

“” = all layers.

“1-3, 7” = layers 1, 2, 3 and 7.

GridTools requires that MikeZero 2011 is installed.

To run gridtools, type “Gridtools conf.xml” in a command prompt in the directory where the gridtools.exe is located or give full path. Conf.xml is the name of the configuration file.

LayerSummation

This tool sums the layers from a .dfs3-file and puts them in a .dfs2-file. It operates on the selected items and all timesteps.

The format of the configuration block is as follows:

```
<GridOperation Type="LayerSummation">
  <DFS3FileName>c:\temp\input.dfs3</DFS3FileName>
  <Layers>0,1</Layers>
  <Items>1</Items>
  <DFS2OutputFileName>c:\temp\output.dfs2</DFS2OutputFileName>
</GridOperation>
```

This will sum layer 0 (the bottom layer) with layer 1 (the layer just above the bottom) from the file `c:\temp\input.dfs3` and put it into `c:\temp\output.dfs2`. The size of the grid, the timesteps, the items will be the same as for the input file. If nothing is written in the “Layers” element it will sum all layers:

```
<GridOperation Type="LayerSummation">
  <DFS3FileName>c:\temp\input.dfs3</DFS3FileName>
  <Layers></Layers>
  <DFS2OutputFileName>c:\temp\output.dfs2</DFS2OutputFileName>
</GridOperation>
```

GridMath

This tool adds, substracts, multiply or divides the values from two items in .dfs2-files for all timesteps and puts them in a new .dfs2-file. The two input files must be on the same grid and have the same number of timesteps. The input items can come from the same or two different .dfs2-files. The format of the configuration block is as follows:

```
<GridOperation Type="GridMath">
  <DFS2FileName1>c:\temp\input1.dfs2</DFS2FileName1>
  <Item1>1</Item1>
  <MathOperation>+</MathOperation>
  <DFS2FileName2>c:\temp\input2.dfs2</DFS2FileName2>
  <Item2>2</Item2>
  <DFS2OutputFileName>c:\temp\output.dfs2</DFS2OutputFileName>
</GridOperation>
```

This will take the first item from the file `c:\temp\input1.dfs2` and add the second item from `c:\temp\input1.dfs2` and put them in `c:\temp\output.dfs2`.

The possible values of the “MathOperation” are: +, -, * and /

FactorMath

This tool adds, substracts, multiply or divides a factor to the selected items and time steps in a .dfs0, .dfs2 or .dfs3-file. It is optional to provide the element “DFSOutputFileName”. If it is not provided the operation will be performed on the input-file.

The format of the configuration block is as follows:

```
<GridOperation Type="FactorMath">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeSteps>0,4,5</TimeSteps>
  <MathOperation>*</MathOperation>
  <Factor>2.5</Factor>
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
</GridOperation>
```

In this case it will multiply 2.5 to all the values in Item 1 for the time steps 0, 4 and 5. If nothing had written in Items and time steps it would have operated on all items and timesteps.

MonthlyMath

This tool is similar to the FactorMath-tool but it allows for a different value for each month. This means that it will for instance multiply 1.5 to all time steps in January and 6.5 to all time steps in February. It is optional

to provide the element “DFSOutputFileName”. If it is not provided the operation will be performed on the input-file.

The format of the configuration block is as follows:

```
<GridOperation Type="MonthlyMath">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeSteps>0,4,5</TimeSteps>
  <MathOperation>/</MathOperation>
  <MonthlyValues>1.5,6.5,3,4,5,6,7,8,9,10,11,12</MonthlyValues>
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
```

A value for each month should always be provided.

TimeSummation

This tool makes a sum of the time steps on a fixed number of days, months or years. It operates on .dfs0, dfs2 and .dfs3-files. If the time interval is set to day and the number of steps is set to 7 it will sum up all values on a weekly basis.

Since time steps have to be equidistant in .dfs2 and .dfs3-files it does not print out at the correct time. In daily summation the sum of the first period is printed on the first time step. In monthly summation it is printed approximately on the 15. of the month. This will vary because the lengths of the months vary. On a yearly basis the value will be printed approximately 1. June.

The format of the configuration block is as follows:

```
<GridOperation Type="TimeSummation">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeInterval>Week</TimeInterval>
  <TimeIntervalSteps>2</TimeIntervalSteps>
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
</GridOperation>
```

The possible values for TimeInterval are: Week, Month or Year. TimeIntervalSteps is an integer number. If it is not set it defaults to 1.

TimeAverage

This tool corresponds to the TimeSummation tool except that it calculates the average value instead of the sum. The input format is the same, just write TimeAverage for the GridOperation type:

```
<GridOperation Type="TimeAverage">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeInterval>Week</TimeInterval>
  < TimeIntervalSteps >1</ TimeIntervalSteps >
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
</GridOperation>
```

TimeMin

This tool corresponds to the TimeSummation tool except that it outputs the minimum value instead of the sum. The input format is the same, just write TimeMin for the GridOperation type:

```
<GridOperation Type="TimeMin">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeInterval>Week</TimeInterval>
  < TimeIntervalSteps >1</ TimeIntervalSteps >
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
</GridOperation>
```

TimeMax

This tool corresponds to the TimeSummation tool except that it outputs the maximum value instead of the sum. The input format is the same, just write TimeMax for the GridOperation type:

```
<GridOperation Type="TimeMax">
  <DFSFileName>c:\temp\input.dfs2</DFSFileName>
  <Items>1</Items>
  <TimeInterval>Week</TimeInterval>
  < TimeIntervalSteps >1</ TimeIntervalSteps >
  <DFSOutputFileName>c:\temp\output.dfs2</DFSOutputFileName>
</GridOperation>
```

Percentiles

This tool calculates the percentiles (“fraktiler”) in time for an Item. It operates on dfs0, dfs2, and dfs3. It outputs a new dfs-file with an item for each percentile. Percentiles should be in the interval]0;1[. The format of the input block is as follows:

```
<GridOperation Type="Percentile">
  <DFSFileName>c:\temp\TestModel_3DSZflow.dfs3</DFSFileName>
  <Item>1</Item>
  <TimeSteps></TimeSteps>
  <TimeInterval>Month</TimeInterval>
  <Percentiles>0.1,0.5,0.9</Percentiles>
  <DFSOutputFileName>c:\temp\Percentiles.dfs3</DFSOutputFileName>
</GridOperation>
```

This will calculate the three percentiles (10%, 50 % and 90%) for each month for Item 1 and all time steps from the file: *c:\temp\TestModel_3DSZflow.dfs3* and put them in three items in *c:\temp\Percentiles.dfs3.* The *TimeInterval* entry is optional and can take the values “Month” or “Year”. When the value is “Month” it will calculate the percentiles based on all the values for each month, i.e. the percentiles for all values in January. When the value is year it will output a set of percentiles for each year in the selected time period.

Input file example

```
<?xml version="1.0" encoding="utf-8"?>
<GridOperations>
  <GridOperation Type="LayerSummation">
    <DFS3FileName>c:\temp\TestModel_3DSZflow.dfs3</DFS3FileName>
    <Items>1</Items>
    <Layers></Layers>
    <DFS2OutputFileName>c:\temp\SummedLayers.dfs2</DFS2OutputFileName>
  </GridOperation>
  <GridOperation Type="GridMath">
    <DFS2FileName1>c:\temp\SummedLayers.dfs2</DFS2FileName1>
    <Item1>1</Item1>
    <MathOperation>+</MathOperation>
    <DFS2FileName2>c:\temp\SummedLayers.dfs2</DFS2FileName2>
    <Item2>2</Item2>
    <DFS2OutputFileName>c:\temp\SummedItems.dfs2</DFS2OutputFileName>
  </GridOperation>
  <GridOperation Type="FactorMath">
    <DFSFileName>c:\temp\SummedItems.dfs2</DFSFileName>
    <Items>1</Items>
    <TimeSteps>1,4,5</TimeSteps>
    <MathOperation>*</MathOperation>
    <Factor>2.5</Factor>
    <DFSOutputFileName>c:\temp\SummedItemsFactored.dfs2</DFSOutputFileName>
  </GridOperation>
  <GridOperation Type="TimeSummation">
    <DFSFileName>c:\temp\SummedItemsFactored.dfs2</DFSFileName>
    <Items>1</Items>
    <TimeInterval>Day</TimeInterval>
    <TimeIntervalSteps>7</TimeIntervalSteps>
    <DFSOutputFileName>c:\temp\WeeklySum.dfs2</DFSOutputFileName>
  </GridOperation>
  <GridOperation Type="MonthlyMath">
    <DFSFileName>c:\temp\SummedItems.dfs2</DFSFileName>
    <Items>1</Items>
    <TimeSteps>1-5</TimeSteps>
    <MathOperation>/</MathOperation>
    <MonthlyValues>1.1,2000,3,4,5,6,7,8,9,10,11,12</MonthlyValues>
    <DFSOutputFileName>c:\temp\SummedItemsMonthly.dfs2</DFSOutputFileName>
  </GridOperation>
  <GridOperation Type="Percentile">
    <DFSFileName>c:\temp\TestModel_3DSZflow.dfs3</DFSFileName>
    <Item>1</Item>
    <TimeSteps></TimeSteps>
    <Percentiles>0.1,0.5,0.9</Percentiles>
    <DFSOutputFileName>c:\temp\Percentiles.dfs2</DFSOutputFileName>
  </GridOperation>
</GridOperations>
```